

ROADS AND MARITIME SERVICES (RMS)

QA SPECIFICATION R302

MAINTENANCE OF VARIABLE MESSAGE SIGNS

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GUIDE NOTES
(Not Part of Contract Document)



MAINTENANCE OF VARIABLE MESSAGE SIGNS

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VERSION FOR: DATE:

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FOREWORD

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When this document forms part of a contract

This document should be read with all the documents forming the Contract.

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REVISIONS TO PREVIOUS VERSION

This document has been released as RMS Specification R302 Edition 1 Revision 0.

All revisions to the previous version (other than minor editorial and project specific changes) are indicated by a vertical line in the margin as shown here, except when it is a new edition and the text has been extensively rewritten.

PROJECT SPECIFIC CHANGES

Any project specific changes have been indicated in the following manner:

- (a) Text which is additional to the base document and which is included in the Specification is shown in bold italics e.g. ***Additional Text***.
- (b) Text which has been deleted from the base document and which is not included in the Specification is shown struck out e.g. ~~Deleted Text~~.

RMS QA SPECIFICATION R302

MAINTENANCE OF VARIABLE MESSAGE SIGNS

1 GENERAL

1.1 SCOPE

This document sets out requirements for the Maintenance of Variable Message Signs (VMS) (the “Services”). The Specification is formed only when this document is read together with RMS QA R300 ITS Maintenance Services – General Requirements.

VMS includes the sign and all supporting components of the system and site. The requirements herein is for Services relevant to a VMS site, so that they remain in good condition, operate as designed and meet the specified performance requirements.

Major components of a VMS site are listed below:-

- a) Variable Message Sign (VMS) unit as defined for all types. Includes display enclosures, display LED boards, conspicuity devices, all associated electronics, electrical and mechanical components contained there in.
- b) Controller Cabinet is structure mounted, ground mounted, or integrated with other cabinets. Includes all control systems electronics, electrical and mechanical components contained there in.
- c) Sign support steel structure for mounting of all types of VMS. Includes all associated fixtures i.e. service platforms, handrails, meshes, brackets, fasteners, safety rails/cables/roller hooks, fixed lifting devices, fixed ladders and surface treatments.
- d) Externally mounted fixtures i.e. antennas, sensors or recording equipment installed onto VMS enclosure, sign support structure and controller cabinet.
- e) Electrical power distribution system from service point of supply (metered/un-metered supply point) up to the VMS. Includes all power cables, switch devices, distribution devices, voltage conversion devices, stabilization devices, fuses, glands, connectors, surge protection devices and clamping fixtures.
- f) Communication distribution system from the service point of supply up to the VMS. Includes all copper & fibre cables, routers, modems, splitters, converter patch boards, protection devices, glands, connectors and clamping fixtures.
- g) Power back up system (where provided). Includes auxiliary power generator, Uninterrupted Power Supply (UPS), Solar panels, battery(s) and charging units.
- h) Site civil infrastructure. Includes concrete pathways, platforms, retaining walls, safety barriers, handrails, drains, landscaping
- i) Signage at site could be static post mounted, painted or labels. Includes site identification on controller cabinets, safety signs and pavement markings.

1.2 Definitions and Abbreviations

The following definitions and abbreviations, in combination with those listed in R300, are applicable to this Specification.

1.2.1 Definitions

Term	Description
Enclosure	A housing providing an appropriate degree of environmental protection and against contact with live parts (AS/NZS 60529).
FCG-VMS	A VMS that is capable of displaying multichromatic text or graphics using intensity control of primary coloured LEDs i.e Red, Green and Blue (could be in conjunction with Amber LEDs).
Monochrome VMS	A Variable Message Sign (VMS) that is capable of displaying monochromatic text or where graphics is provided.
Power backup equipment	Includes backup power generator, UPS, batteries and charging units, photovoltaic power supply (where applicable), power regulators, etc.
Protocol	RMS Communications Protocol For Roadside Devices (RMS Specification TSI-SP-003)
Supply Point (also known as Connection Point)	The junction of the electricity distributor's low voltage network conductors with the consumer's mains, i.e. the point at which the power supply is connected to the Utility network.
Sign	Same as VMS, includes all types.
Supports	All structural components, brackets, clamps, straps and parts thereof, used to support the VMS Equipment.
Site/work site	Variable Message Sign site

1.2.2 Abbreviations

Term	Description
AC	Alternating current
DC	Direct current
EPV	Elevated platform vehicle (same as elevated work platform)
FCG	Full colour graphic; a capability of a display made of RGBA pixels
LED	Light Emitting Diode
OEM	Original Equipment Manufacturer
O&M	Operations and Maintenance
RCD	Residual current device
RGBA	Red-Green-Blue-Amber
TFS	Tidal Flow Systems
VMS	Variable Message Sign (fixed) – a sign made of a programmable controller and active display for conveying transport related information and messages to road users.

1.3 RELEVANT DOCUMENTS AND ORDER OF PRECEDENCE

This document must be read together with RMS QA R300 – ITS Maintenance Services – General Requirements.

Other relevant RMS specifications and O&M manuals are listed in **Annexure R302/A**.

In the event of any conflicting requirements between documents, the order of precedence must be:

1. Statutory and legislated requirements.
2. This specification (QA Specification R302) read in conjunction with QA Specification R300.
3. Other RMS ITS Maintenance specifications - listed in Annexure R302/A.
4. RMS ITS Equipment specifications - listed in Annexure R302/A.
5. O&M manuals - listed in Annexure R302/A.
6. Australian Standards.

2 MAINTENANCE SERVICES

You must undertake maintenance services of the VMS system and site components as described in clause 1.1 and in accordance with the approved Asset Maintenance Plan and Forward Works Program.

2.1 PLANNED MAINTENANCE

Planned Maintenance Services must adhere to requirements given in QA Specification R300, ITS Maintenance Services – General Requirements. A combination of inspections/checks and preventative maintenance activities constitute planned maintenance to ensure continued serviceability and availability of a VMS asset.

Minimum planned maintenance inspection/checks are;

- a) VMS display operation.
- b) Condition of VMS enclosure, support structure, controller cabinet and other externally mounted accessories for damage, disfigurement (including vandalism), peeling or damaged galvanizing/paint surface coating and corrosion.
- c) Presence of moisture, dirt, vermin/insects inside VMS enclosure, Controller cabinet, pits, exposed ducts and steel structure crevices.
- d) Wearing off or damaged site infrastructure i.e. concrete pathways, platforms, retaining walls, safety barriers, handrails, drains, landscaping etc.

Annexure R302/B is a sample Planned Maintenance Service checklist for both checks/inspections and preventative maintenance items.

Planned maintenance frequency will be 12 months.

2.2 REACTIVE MAINTENANCE

2.2.1 Fault Attendance Service

You must provide a fault attendance service on twenty-four (24) hours per day, seven (7) days per week basis for all VMS faults.

Typical causes of VMS faults include, but are not limited to;

- a) Sign Controller and associated equipment malfunctions,
- b) LED display failures,
- c) conspicuity device failures,
- d) power & communication equipment malfunctions,
- e) power and communication cabling and wiring damage,
- f) overheating of electronics inside sign and controller enclosures,
- g) moisture or dust ingress,
- h) accident damage,
- i) storm damage, and
- j) Vandalism.

All repair works must be in accordance with RMS Specifications listed in Clause 1.3 or as amended.

2.2.2 Procedure

You must make arrangements to continually monitor the Fault Management System(s) for VMS.

These systems, hosted by RMS, currently include:

- CMCS FMS web page for fault log on the intranet; and
- PEGA Case Manager.

You will be provided with access (e.g. remote login via VPN) to these systems. You may also develop your own software interface to read the CMCS “flat file” which is periodically updated with VMS fault status. In that case you will be provided with access to the CMCS “flat file” and a description of its structure.

Upon fault notification, you must review the nature and urgency of the problem and prioritise your response. You must dispatch appropriately skilled resource(s)/technician(s) to attend the site as soon as possible, but within the specified response time (see clause 2.2.3 for Response Time and Repair Time). Notification of the fault is either via phone callout or at the start of shift of your resource(s)/technician(s). It is expected that your skilled resource(s)/technician(s) review current faults at the start of their shift to determine their work priorities.

Upon arriving on site you must log the time of attendance in PEGA Case Manager together with your initial findings and any other relevant information (e.g. estimated time to repair). Alternatively, if PEGA Case Manager is unavailable, you may notify the TMC by phone.

You must assess whether the condition of the site poses any safety hazards to motorists or the public and make the site safe as a matter of priority.

In the event of a power failure, you must first contact the electricity distributor from off-site to ascertain that the cause of the outage is upstream of the VMS supply point. You must still ascertain from site that there are no other power equipment failures at the VMS site and then enter the appropriate fault response details in PEGA Case Manager.

In the event of a communications failure, you must first contact the service providers i.e. Telstra, Optus etc to ascertain that the failure is external to the VMS system. Once confirmed, you must log communications faults with the appropriate third party communications service provider and follow-up to expedite rectification of the fault. You must still ascertain from site that there are no other communication equipment failures at the VMS site and then enter the appropriate fault response details in PEGA Case Manager.

2.2.3 Response Times for Fault Attendance

Response time starts from the initial fault occurrence time stamp in the appropriate electronic Fault Management System or from the time of the fault call (whichever is earlier) and is the sum of following;

- Remote investigation time to ascertain nature of defect(s)
- Equipment/parts/materials preparation time, and
- Travel time to site.

Response times for initial site attendance upon notification of a VMS fault is guided by the criterion in **Annexure R302/C**.

Service provider to locate maintenance crews to facilitate their travel time to site.

2.2.4 Repair Time

Repair time at site is the time taken to trouble-shoot the fault, completely repair the asset and make it available for service. Asset downtime directly effects operational availability. Swift, efficient and well coordinated repairs will bring the asset back into operation quickly and positively affect performance targets.

You must inform RMS as soon as possible of any abnormal delays, reasons for delayed repairs and estimate of the time required to complete the repairs.

2.2.5 Repetitive Failures

Where the same reported fault requires callouts on three (3) occasions within a fourteen (14) day period you must carry out root cause analysis, identify and implement appropriate actions to prevent recurrence.

Where these actions recommend replacement or major renewal of the VMS asset and these works have not been included in the current Forward Works Program (FWP) you must submit a Business Case to RMS for approval. The Business Case must be based on a life cycle cost comparison of the proposed

action against a “business as usual” maintenance approach. If RMS agrees with your recommendations the renewal or replacement works will be included in the next FWP.

Till the recommended and approved replacement works in the FWP are completed, the availability target (%) will be reviewed and a lower KPI may be accepted or under unsustainable operating conditions, the asset excluded from the KPI assessment until replaced.

2.2.6 Requests for RMS Assistance

Where a technical problem cannot be resolved by you, you may request assistance from RMS. When requesting assistance you must be able to demonstrate to RMS that the technical problem is complex and/or outside your scope of services, e.g. system integration issues with RMS or TMC systems.

If the technical problem cannot be resolved by RMS remotely, a site visit will be arranged by RMS at a mutually agreeable time. You must attend the site with relevant documents and information related to the technical problem.

2.3 INCIDENT SUPPORT

An Incident Support report should be raised when;

- an incident is known to your team
- or when informed by the TMC
- or by the relevant SMC Service Provider.

In the event of an incident, response time and repair time for Reactive Maintenance applies.

On site attendance, you must assess whether the condition of the site poses any safety hazards to the public and make the site safe as a matter of priority.

You must also prioritise and rectify all other faults and defects as if for Reactive Maintenance.

You must record the Incident Support details in PEGA Case Manager. If PEGA Case Manager is unavailable or inaccessible, the report form in **Annexure R302/D** may be used on site. PEGA Case manager should be updated on first available opportunity.

You must assist RMS with all insurance claims and recovery actions arising from the incident.

Incident Support reports must be submitted as part of your monthly report to RMS.

3 PARTS AND EQUIPMENT

3.1 SUPPLY

You must arrange and manage supply of all parts, equipment, materials and technical services from OEM suppliers for the purpose of making available the VMS site. Quality of parts, equipment and technical services from OEMs is to be assured.

When supply disruptions occur due to unavailability or obsolescence of a part or equipment, a Replacement part or equipment is to be recommended to RMS as a business case. RMS may approve use of the Replacement part or equipment after necessary technical review and testing.

3.2 HOLDING STOCK

At all times, you must hold in stock adequate minimum levels of parts and equipment to meet Planned and Reactive Maintenance needs.

Contractor is to determine minimum stock levels for parts, equipment and materials based on VMS maintenance scope.

An inventory of spares for parts, equipment, materials and technical services is to be maintained by the Contractor. Inventory is to update minimum stock levels and holding stock periodically to match the VMS maintenance scope.

Inventory of spares is to be updated for Replacement parts and equipment, on approval by RMS.

3.3 DISPOSAL OF DAMAGED, DEFECTIVE, OBSOLETE OR REDUNDANT PARTS & EQUIPMENT

Due to maintenance or incidents, parts and equipment which are damaged, defective, obsolete or redundant are required to be removed from the Work Site and disposed. Such removal is to be done after formal information and agreement with RMS.

Such parts and equipment are to be distinctly and permanently marked prior to disposal by indicating their condition.

Disposal of parts and equipment is to be done as follows;

- a) Repair or refurbish the parts or equipment and hold them as spares in store for future use. For purposes of quality assurance, repaired or refurbished parts are to be treated the same as Replacement parts & equipment (Clause 3.1). Their repair history is to be maintained and made available to RMS when requested.
- b) Carry out disposal of parts and equipment that are beyond-economical-repair (BER) by recycling. Items being disposed must be physically disfigured prior to recycling at a certified facility. Certificate of disposal must be provided.

4 PERFORMANCE REQUIREMENTS (ASSET SPECIFIC)

You must meet the included Key Result Areas (KRAs) and Key Performance Indicators (KPIs) for performance of your Services.

Your asset Inspection and Planned Maintenance Services must support a design life for each VMS asset i.e. site availability should be sustained during design life for different components comprising a VMS site. Design life of different components varies as follows;

- VMS electronics and electrical components- Fifteen (15) years.
- Steel fabricated Sign Support Structures, Brackets and Fixtures – Fifty (50) years.
- Concrete & Masonry construction at Site - Thirty (30) years.
- Power back-up system / Batteries – Five (5) years.

As per definitions given in R300 the following performance criteria will be measured:

- a) Availability
- b) Response Time
- c) Repair effectiveness Time

Premature asset failures requiring major renewal or replacement of the asset (other than due to Incidents or Force Majeure events) may reduce your overall Stewardship Performance KPI score.

4.1 AVAILABILITY (OPERATIONAL)

RMS QA R300 defines Availability for ITS assets. Performance calculation method is provided in the contract. The performance target for VMS availability is 98%.

Availability as defined in R300 will be measured monthly by you across all VMS assets in your Zone.

Failure to meet the Availability performance targets will impact on your Asset Performance KPI score.

4.2 RESPONSE TIME AND REPAIR EFFECTIVENESS

The measure of Response Time and Repair Effectiveness is defined in R300.

5 REPORTING AND RECORD KEEPING

5.1 REPORTING

You must provide a monthly performance report to RMS on work achievement against the FWP and asset performance statistics by the second week of the following month. The report must include the following items:

- (i) Availability
- (ii) Response Time
- (iii) Repair Effectiveness

See R300 for Availability, Response Time and Repair Effectiveness definitions.

You must report on the status of fault attendance and repairs through the appropriate Fault Management Systems in accordance with Clause 6.3 in R300.

These reports will be included in the KPI assessments by end of every month in accordance with the contract.

5.2 RECORD KEEPING

You must keep and maintain accurate records of all repairs, calibrations, replacements and design alterations made to any VMS Equipment/site.

All Reactive and Planned Maintenance service attendances must be recorded in the electronic fault management system. Details of each attendance must also be manually recorded with you and should include the date and details of service carried out with the technician's name.

You must maintain all necessary records to support the monthly evaluation of actual performance against the specific performance targets.

You must retain records, including all details for accidents/damages/repairs for a period of at least five (5) years.

ANNEXURE R302/A – REFERENCE DOCUMENTS

A1 RMS ITS Maintenance Specifications

RMS QA R305 Maintenance of Tidal Flow Systems

A2 RMS ITS Equipment Specifications

TSI-SP-008 General Requirements For Variable Message Signs

TSI-SP-003 Communications Protocol For Roadside Devices

A3 O&M Manuals

Refer to respective O&M Manuals for the make and model number of each VMS. O&M Manual is supplied by OEM.

A4 Australian Standards

AS 4852.1 Variable message signs - Fixed signs

ANNEXURE R302/B – SAMPLE PLANNED MAINTENANCE SERVICE REPORT

VMS ID: LOCATION:

REPORT DATE:

1. Mark as actioned for each item with a ✓ in the “ACTIONED” columns.
2. If any item requires further attention, write reasons in comments column and mark that item with a ✓ in the “for further action (FFA)” column.
3. Enter date in dd/mm/yy format and time in 24 hour format.

PREVENTATIVE MAINTENANCE ITEMS	ACTIONED	COMMENTS	FFA
Controller Cabinet			
Clean Cabinet and check for moisture ingress. Repair as necessary.			
Check all labels and replace as necessary			
Check Communication and Power pits for water and other damage, clean as necessary			
Check exterior for damage or graffiti. Repair damage or remove graffiti. Report date or damage to RMS.			
Check condition, replace and lubricate door locks, hinges & seals as required			
Check that log sheet and WEA drawings are complete and intact. If WAE drawings missing or damaged, prepare hand sketches at site and forward to RMS to reproduce.			
Physically check switchboard and RCD items.		RCD tripping current:	

Reset circuit breakers.		RCD tester make and model:	
Measure RCD tripping current (in mA)			
Locate MEN connection inside the cabinet			
Visually/physically check wiring/terminations/earthing items, tighten if required.			
Check and secure Earth connection. Measure Earth insulation reading using insulation tester		Reading between Earth stake & Door : Reading between Earth stake & Mains Earth: _____	
Check if surge protector is installed		Surge protector make and model: _____	
Sign controller and communication equipment			
Inspect electronics of Sign controller and communication equipment for symptoms of electrical or thermal fatigue. Repair or replace as needed			
Remove mains power; verify uninterrupted controller operation. Check existing battery voltage and charger operation.		Date on battery label or proof of purchase: Date of expiry of battery OEM's warranty:	
Replace and label battery as specified, if date reached / 400 recharge cycles to 80% depth of charge.			
Check communication equipment jumper settings Use Maintenance software to check for data corruptions over the complete communications link (ISDN, Ethernet, 3G, etc). Comment findings.			
Retrieve Sign fault log. Repair or report as necessary.			

Display			
Inspect sign display for symptoms of electrical or thermal fatigue. Repair or replace as necessary.			
Sign enclosure			
Check Sign support post and walkway platform structure including ladder and safety system for damage / corrosion / peeling galvanisation or paint.			
Check sign view from target distance; Clear tree branches if interfering with display.			
Check maintenance walkway for bridging plates security.			
Clean/vacuum gantry walk way/bridging plates of leaves etc.			
Check outside of sign enclosure for any peeling of paint, damage, graffiti or corrosion. Remove defect as necessary			
Check inside of sign enclosure for water leakage or presence of moisture damage. Locate leakage point, report and repair as necessary.			
Clean light sensor cover. Reseal if needed or replace if damaged.			
Check conspicuity doors or access points for rusted screws, replace if necessary			
Check cooling fan operation. Repair or replace as necessary			
Check thermoelectric cooling modules (e.g. Peltier), for evidence of condensation on the cold side. Repair or replace as necessary. Comment “NA” if not available with VMS make and type.			
Remove any weeds or grass near cabinet and equipment			

Inspect for damaged or missing covers, doors or hatches and replace as necessary.			
-----------------------------------------------------------------------------------	--	--	--

1. Mark condition of each item with a ✓ in “PASSED/FAILED/REPAIRED” columns.
2. Mark condition CF or NCF in the FAILED column to categorize.
3. If any item requires further attention, write reasons in comments column and mark item with a ✓ in the “for further action (FFA)” column.
4. Enter date in dd/mm/yy format and time in 24 hour format.

FUNCTIONAL INSPECTION ITEMS	PASSED	FAILED	REPAIRED	COMMENTS	FFA
Sign functions					
Start VMS Maintenance software provided by RMS					
Establish communication via sign controller’s maintenance port (default 38400 baud)					
Display frame with all pixels ON and all conspicuity devices flashing; visually check if all pixels are ON and verify with Sign status reply					
Blank display; visually monitor sign response and verify with sign status reply					
Turn facility switch to OFF; visually verify that display is blanked; verify that sign status reply reflects display status before facility switch override					
Turn facility switch to MSG1; visually verify that Message 1 is displayed; verify that sign status reply reflects display status before facility switch override					

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Turn facility switch to MSG2; visually verify that Message 2 is displayed; verify that sign status reply reflects display status before facility switch override					
Turn facility switch back to AUTO; visually verify that display resumes if Plan was active or blanks if no Plan was active; verify that sign status reply reflects display status before facility switch override					
Retrieve sign fault log; verify fault log is reporting sign and controller errors					
Non-destructively raise temperature of sign temperature sensor to designed temperature maximum in TSI-SP-008; verify that the fans turn ON and display blanks; let the temperature reduce below the designed upper limit; verify that the fans turn OFF					
Inspect for any obstructions to light sensor and clean or repair in compliance with TSI-SP-008					
Cover light sensor completely and visually monitor luminance level adjustments of display for at most five (5) minutes; verify that sign status reply reflects display luminance level					
Uncover light sensor completely and visually monitor luminance level adjustments of display, for at most five (5) minutes; verify that sign status reply reflects display luminance level					
Turn all switches OFF & ON.					
Turn all circuit-breakers OFF and reset; sign should report a fault log entry and clearance indicating the related power failure					
Inspect condition of controller					
Check for high resistance joints					

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Check for damaged cables					
Clean and lubricate all mechanical components then cover to test functionality					
Check MEN and earthing					

TECHNICIAN: **COMPANY:**

SIGNATURE: **DATE SIGNED:**

DATE SENT TO RMS:

ANNEXURE R302/C – FAULTS TYPES AND RESPONSE TIMES

Response times for initial site attendance upon notification of VMS faults are detailed in R300 (Clause 6.2.1 Response Times and **Annexure D**). R300 categorizes ITS assets as either High Priority or Normal Priority and assigns suitable response times.

ANNEXURE R302/D – SAMPLE INCIDENT SUPPORT REPORT

VMS ID: **LOCATION:**

INCIDENT DATE: **REPORT DATE:**

Incident Details	
When reported	
Who reported	
Was Incident or fault a dangerous situation? (Y/N)	
Police attendance? (Yes/No) Police Report #:	
Details of any vehicles involved	
Attending supervisor and team at site. Date and time.	
Immediate Safety measures taken. Date & time.	
Power Supply Point / post identification number	

Initial Repair undertaken. Date & time	
Details of long term repair. Whom forwarded to for action.	
Description of replaced equipment and cost of equipment plus materials	
Number of hours claimed for complete repair	
Notes & Comments	

TECHNICIAN: **COMPANY:**

SIGNATURE: **DATE SIGNED:**

DATE SENT TO RMS: